BIOCIDES INICIATIVES

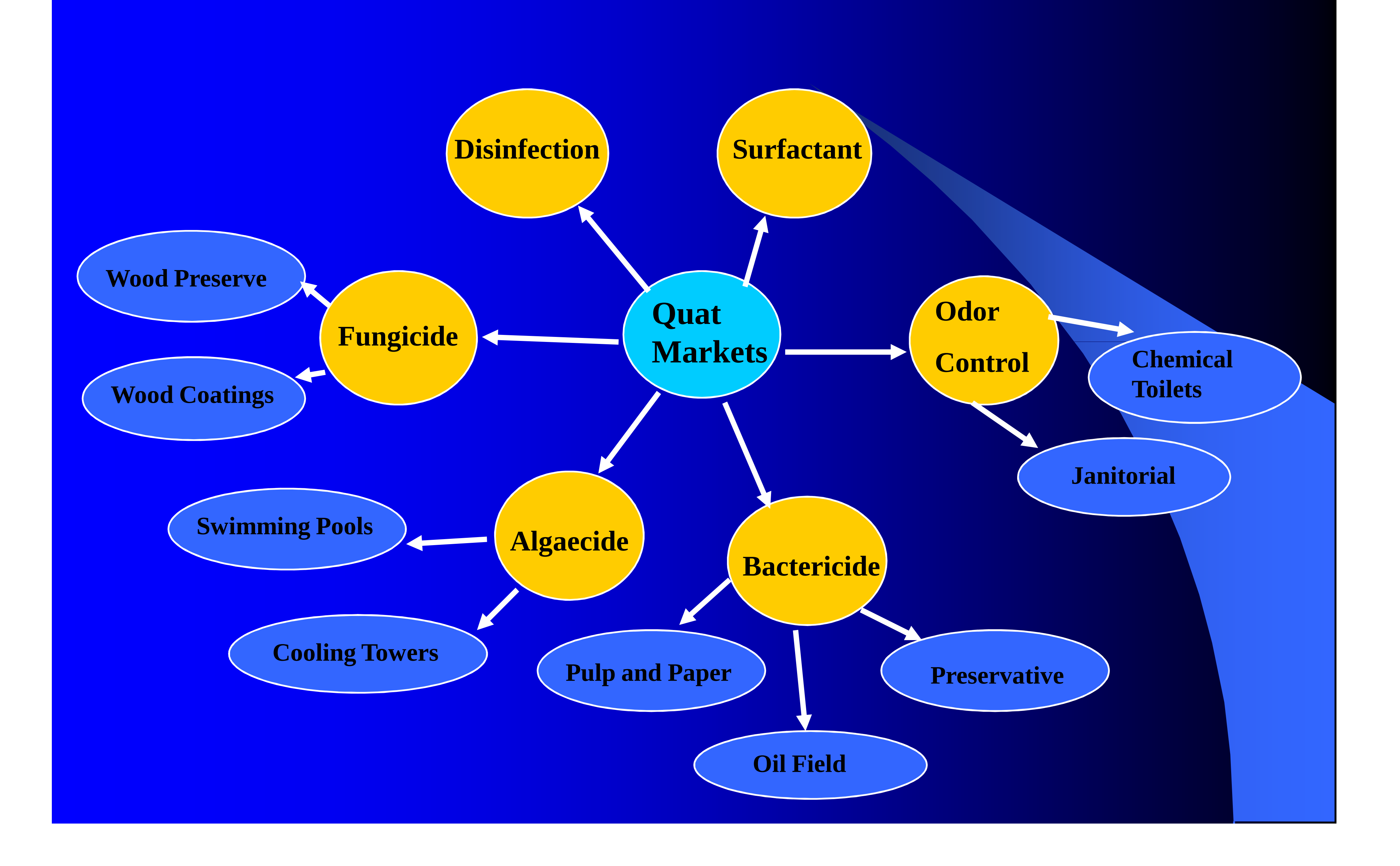
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Stepan Colombiana de Químicos S.A.

2010



Stepan Company


Quaternary Market Map
Disinfection
Surfactant
Wood Preserve
Fungicide
Quat Markets
Odor Control
Chemical Toilets
Wood Coatings
Janitorial
Swimming Pools
Algaecide
Bactericide
Cooling Towers
Pulp and Paper
Preservative
Oil Field

Disinfection Market Map



Quat Chemistry

Chemical Description of Quaternaries

- Quaternaries are the reaction products of tertiary amines and alkyl halides.
- General Formula:

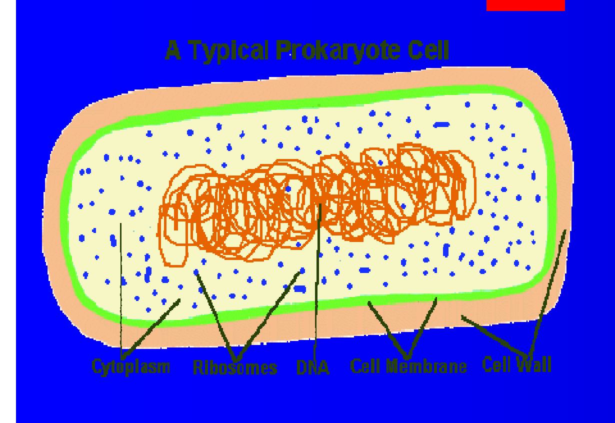
$$\left[\begin{array}{c} R \\ | \\ R\text{-}N\text{-}R \\ | \\ R \end{array} \right]^{+} X^{-}$$

R=Alkyl or Aryl groups

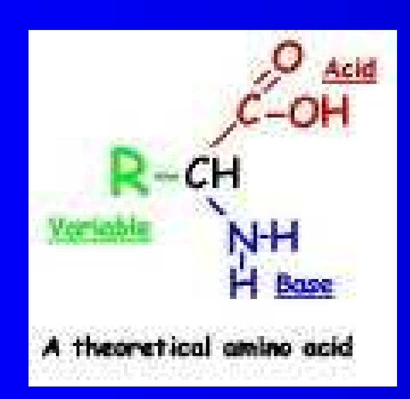
X=Halide (Chloride, bromide) or counter ion

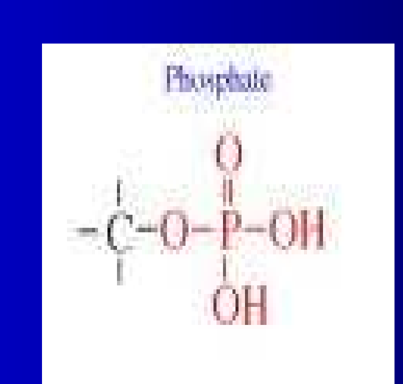
Mechanism of Action of Quats

BTC's Kill Bacteria:



- Cationic (+)
- Bind well to (-) charged bacterial membrane:
  - Carboxyl (COOH) groups
  - Phosphates (P) groups
- The "lysing" or cutting open of the cell wall is what contributes to the fast speed of kill and broad spectrum activity associated with quats.





Quaternaries Chemical Families

- There are three families of quats:
  - Alkyl dimethyl benzyl ammonium chloride
    Reaction of: Alkyl amines & Benzyl chloride
    Acronym: ADBAC
  - Alkyl dimethyl ethyl benzyl ammonium chloride
    Reaction of: Alkyl amines & Ethyl benzyl chloride
    Acronym: **ADEBAC**
  - Dialkyl dimethyl ammonium chloride
    Reaction of: Dialkyl amines & Methyl chloride
    Acronym: **DDAC**

ADBAC

Alkyl Dimethyl Benzyl Ammonium Chlorides

R-N (CH_3 / CH_3) + Cl – CH_2 - [benzene ring] ⇒ [CH_3 | R-N-CH_2 – [benzene ring] | CH_3]$^+$ Cl-

R= C12, C14, C16, C18

Alkyl Amine + Benzyl Chloride ⇒ ADBAC

R= C12, C14, C16, C18

↓

To make our various ADBAC products we vary the ratio of the four amines

ADEBAC

Alkyl Dimethyl Ethyl Benzyl Ammonium Chlorides

$R{-}N(CH_3)_2$ + $Cl - CH_2 - C_6H_4 - C_2H_5$ → $[R{-}N(CH_3)_2{-}CH_2 - C_6H_4 - C_2H_5]^+$ Cl^-

R= C12, C14, C16, C18

Alkyl Amine + Ethyl Benzyl Chloride → ADEBAC

R= C12, C14, C16, C18

ADEBAC is sold only in a blend with ADBAC as 2125M

DDAC

Dialkyl Dimethyl Ammonium Chlorides

Dialkyl Quats

R
N - CH_3 + CH_3 Cl ⇒ [R | R-N-CH_2 - | CH_3]$^+$ Cl-
R

R= C8, C10

Dialkyl Amine + Methyl Chloride ⇒ DDAC

R= C10/C10 or C8/C10   R= C10/C10 or C8/C10

BTC 818 , 818-80%, 1010 & 1010-80% are DDACs.

Generation of Quats

- Another way quats are categorized is to group them into generations. *This is loosely tied to the order they were introduced to the market.*

- Generation 1 ADBAC
- Generation 2 ADEBAC

  (never commercially sold alone)
- Generation 3 ADBAC/ADEBAC blend
- Generation 4 DDAC
- Generation 5 DDAC/ADBAC blend

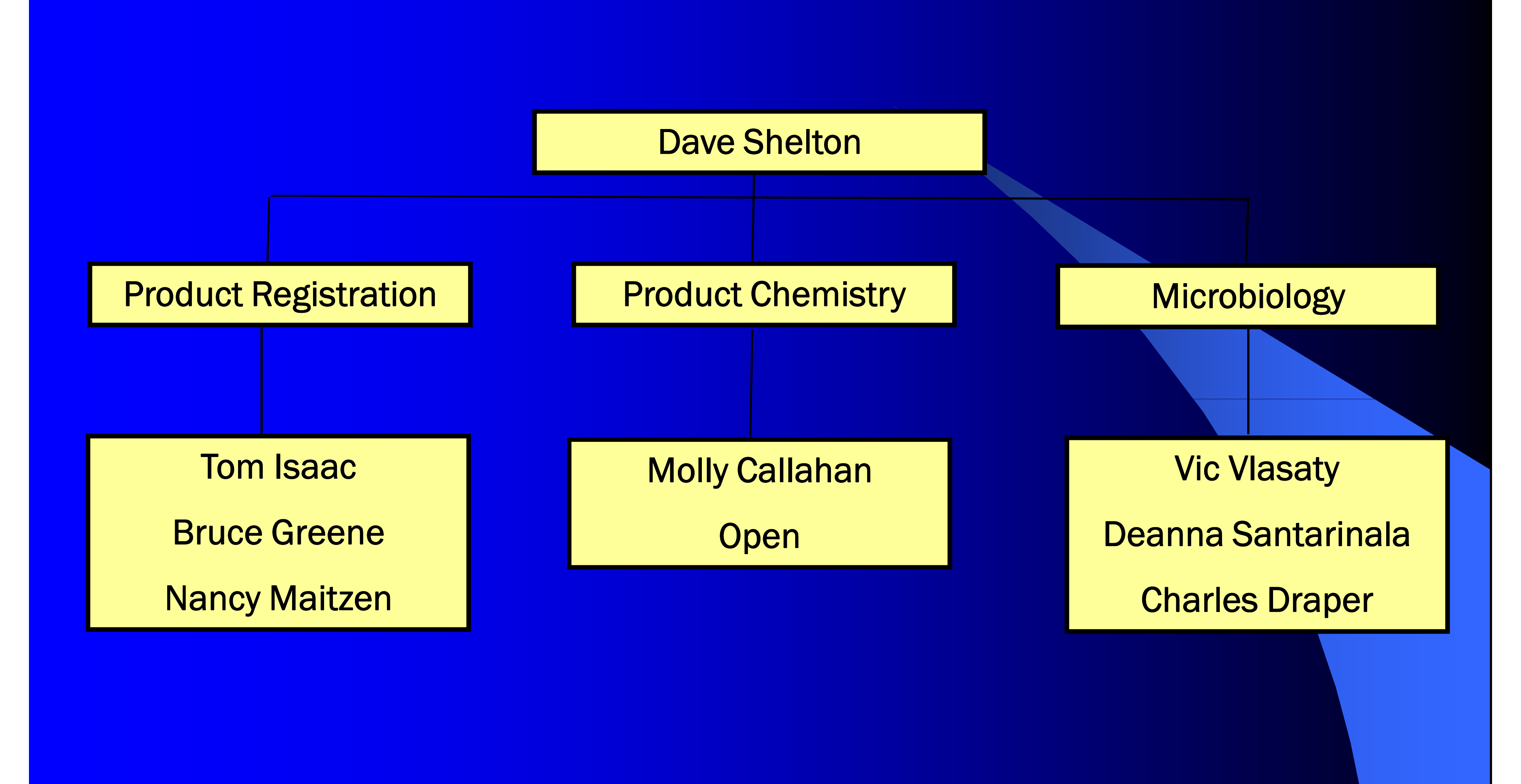
Performance Trends

	Cost	Hard Water Tolerance	Fungal Activity
• Generation 1	Lowest		
• Generation 3		Better	
• Generation 4	Highest	Best	Best
• Generation 5	High	Better	Better

STEPAN BTC®
Typical Use Concentrations

Application	ppm (Active Ingredient)
Hard Surface Disinfectant	450-850
Hard Surface Sanitizer	150-200
Food Processing Equipment Sanitizer	200-400
Eating Utensil Sanitizer	200
Fabric Sanitizer	250-300

Stepan’s Antimicrobial Department


The Team
Dave Shelton
Product Registration
Product Chemistry
Microbiology
Tom Isaac
Bruce Greene
Nancy Maitzen
Molly Callahan
Open
Vic Vlasaty
Deanna Santarinala
Charles Draper

Stepan Microbiology Laboratory

- Established 1987 - Acquisition of Onyx Chemical
- BioSafety Level - 2 (BSL-2) Laboratory
- Testing Capabilities: Determination of Antimicrobial Efficacy (bacteria, fungi, algae), Preservation Testing, Bacterial Identifications, Technical Consultation Services
- Cumulative Lab Experience: 3 microbiologists, 70 years
- Good Laboratory Practice (GLP) Compliant
  - Accredited by the Council for Antimicrobial Quality (CAQ)

Testing/Technical Services On-Site

- **R&D Support**
  - Perform 20+ AOAC, ASTM, EPA antimicrobial testing procedures for evaluation of dilutable concentrates, ready-to-use & antimicrobial wipe products
  - In-Vitro Topical Antimicrobial Testing (antibac handwash products)
  - Preservative Challenge Testing (CTFA, USP)
- **Regulatory Support**
  - Global Registration (Europe BPD, US Federal, Canada)
  - State Registration Support and Label Compliance Review
  - Re-registration Eligibility Decisions
- **Manufacturing Support**
  - QA testing
  - Training & auditing services
- **External customer technical support**

Lead Formulations for the Janitorial Market

- **NDC**
  - Neutral disinfectant cleaner concentrate that you dilute in a bucket, clean mostly floors.
    - Schools, buildings, hospitals
- **Hospital grade READY TO USE spray**
  - Ready to use product used in a spray bottle, disinfect surfaces primarily in a hospital
- **10% Disinfectant –Sanitizer**
  - Work horse of the industry. Diluted down for use in third sink sanitization

AH1N1 Flu Formulations

<u>Effective against both avian influenza virus and human influenza virus</u>

US EPA Registration No.	Registration Name
1839-79	NP4.5 Detergent/Disinfectant
1839-83*	Detergent Disinfectant Pump Spray
1839-86	BTC® 2125M 10% Solution
1839-95	NP 4.5 (D&F) Detergent/Disinfectant
1839-155	BTC® 2125M 20% Solution
1839-166	BTC® 885 Neutral Disinfectant Cleaner-128
1839-167	BTC® 885 Neutral Disinfectant Cleaner-256
1839-169	BTC® 885 Neutral Disinfectant Cleaner-64
1839-173*	7.5% BTC® 885 Disinfectant/Sanitizer
1839-190	STEPAN® Disinfectant Wipe

Did you know we have a STEPAN® Disinfectant Wipe (EPA Reg. No. 1839-190) with a **<u>5 minute contact time</u>** against influenza virus!

** 1839-83 effective against Avian Influenza – H3N2 and H9N2. It has not been tested for human influenza virus.*

BTC® 885
Neutral Disinfectant Cleaners

- **Four formulations with a wide range of dilution ratios.**
  (1/2 ounce to 4 ounce)
- **Neutrals can be used on a wide variety of surfaces.**
  - **Good one-step detergency without dulling of high gloss floor finishes.**
- **5th generation quat**
  - **Remains effective under adverse conditions of high water hardness (400 ppm as $CaCO_3$) and organic soil (5% blood serum)**
- **Great Claims – Broad Spectrum**
  - **Received SARS and Avian Influenza A**
  - **Full complement of Blood Borne Pathogens**
    - **HBV, HCV, Human Coronavirus, BVDV, HIV-1, HIV-2 and Rotavirus**
  - **Tested on 47 bacteria/fungi**
  - **Tested on 17 Viruses (envelope):**
    - **Herpes I and Herpes II**
    - **MRSA, VISA and the flesh eating virus (S. pyogenes)**

Detergent Disinfectant Pump Spray 1839-83

- Ready to Use, Great Claims
  - Tuberculocidal
    - The **only** quat-based formulation that can make the claim and is alcohol free.
    - The TB claim allows it to be used in hospitals to clean up blood spills
  - Full spectrum of Blood Borne Pathogens
    - HBV, HCV, HIV-1
  - Canine Parvovirus claim
    - A must for veterinarian applications
  - Viruses: MRSA, VISA and VRE
  - Norwalk Virus Claim
    - Cruise ship virus
- Alcohol Free, Bleach Free, Non-Flammable
- Fantastic cleaning!

BTC 2125M 10% Solution 1839-86

- A very simple formulation with great claims and numerous end use sites.
- The simplicity of the formulation allows you to dilute from a hospital disinfectant all the way down to a 200 ppm food contact surface sanitizer.
- Great Claims
  - Full complement of Blood Borne Pathogens
    - HBV, HCV, BVDV, HIV-1, Human Coronavirus
  - Norwalk Virus Claim
    - Cruise ship virus
  - Antibiotic Resistant Bacteria: MRSA, VISA
  - Effective against Avian Influenza A/Turkey/Wisconsin

Veterinarian Type Disinfectant 1839-100

- Versatile disinfectant & virucide tailored to veterinarian, animal care, farm premise and equipment niche market
- 1 ounce per gallon general disinfectant
- Extensive pathogen claims
  - – BVDV, Norovirus, Feline Calicivirus, Canine Coronavirus and more!
- 4 ounce per gallon Canine parvovirus claim!
- California Approved!

Future Formulations – BTC® 1210-based

- **3 major families of 1210 formulations**
  - BTC 1210-10%, BTC 1210-7.5%
    - 5th Gen sanitizer and disinfectant
    - Good set of claims
    - 400 ppm hard water disinfectant claims

    Coming Soon!
  - SC-AHD's and SC-NDC's (3 dilutions each)
    - Great 5th gen alkaline concentrate, neutrals
    - 10 min hospital disinfectant claims, 5 min or less virucidal, fungicidal and selected bactericidal claims

Consumer Aerosols

- 1839-85 Aerosol Surface Disinfectant
  - General disinfectant
  - Not a cleaner
  - **Like Lysol**
- 1839-84 Aerosol Detergent Disinfectant
  - General disinfectant.
  - Foams when sprayed
  - Will add “Kills 99.9% of bacteria” sanitizer claim
  - **Like Scrubbing Bubbles**
- 1839-188 : Surface Disinfectant Air Sanitizer
  - Added Claim of surface disinfectant
  - **Air Sanitizer like “OUST”**







New Pathogen Upgrades and Use Sites

- **Bacteria** –
  - MDR A. baumannii, CA MRSA, VISA, VRE, MRSE, clinical isolates, ESBL bacteria, “food pathogens”, etc.
- **Viruses** –
  - SARS, HBV, HCV, CPV, Norovirus, PRRSV, Mumps, Rhinovirus, various flu strains, etc.
- **Fungi** –
  - A. niger, T. mentagrophytes
- **Use Sites** –
  - doorway foam, rubber gloves, drains

INTRODUCING

STEPAN WIPE ANY HARD SURFACE

(EPA Reg. No. 1839-221)

STEPAN, the D/S[1] Wipes Innovation Leader

STEPAN® WIPE

(Optional statements:)
(NEW)(QUICK)(EASY)(EFFECTIVE)(FAST EFFECTIVE) (CONVENIENT)
FOOD CONTACT SURFACE SANITIZER
Sanitizer for Homes, Institutional and Industrial Use (schools, dairies, restaurants, bars, taverns, institutional kitchens, food handling and processing areas)
Sanitizer (Sanitizes)
ANTIBACTERIAL FORMULA SANITIZES (FOOD) (and) (NON-FOOD) CONTACT SURFACES
Kills 99.999% of Bacteria in (60 seconds) (1 minute)*
Kills 99.9% of Bacteria in (just) 30 Seconds (!)**

* *Staphylococcus aureus (Staph), Escherichia coli (E. coli)*
** *Staphylococcus aureus (Staph), Klebsiella pneumoniae*

ACTIVE INGREDIENTS	
Didecyl dimethyl ammonium chloride.....................	0.024%
Alkyl (40% C_{12}, 50% C_{14}, 10% C_{16}) dimethyl benzyl ammonium chlorides..................................	0.016%
INERT INGREDIENTS	99.960%
Total	100.000%

- 400 ppm QUAT concentration
- 5th generation QUAT (BTC 1210-80%)
- No dye, no fragrances
- Substrate: Ahlstrom Grade SX-145

Key Features & Benefits

Feature	Benefit
Alcohol Free	✓ No dry out of the towelette, unsealed packages don't dry out ✓ Lower cost – no isopropanol or other ingredients ✓ Non-flammable
Bleach Free	✓ Bleach needs surface to be rinsed after wiping ✓ Odor
Sanitizer Claim	✓ Does not require surface to be rinsed after wiping; - if disinfectant wipe used on a food contact surface, EPA requires a potable water rinse
Numerous Applications	✓ Only need 1 wipe for all areas; - Consumer (kitchen, baby's room, bathroom) - Institutional (school, offices, restaurants, grocery) - Industrial (food handling and processing)
Fast Antimicrobial Kill	✓ Quickly reduces microbial contamination levels; - Kills 99.999% of bacteria that cause food borne illness in 1 minute - Kills 99.9% of bacteria in 30 seconds
Sanitize 1.28 $inch^2$ of Surface	✓ Only EPA approved wipe with supporting data "Mileage"; - EPA is now requiring D/S wipe suppliers provide supporting data for area of coverage

Wipes Family

	Wipe Any Hard Surface 1839-221	Stepan Disinfectant Wipes 1839-190	Stepan Towelette 1839-174
Value Proposition	***"No Rinse Food Contact Surface Sanitizer"***	***"Hospital To Home Fast Kill Disinfectant"***	***"Hospital TB Grade Disinfectant"***
Formulation Feature	Quat. Based (Alcohol - Bleach Free)	Quat. Based (Alcohol - Bleach Free)	Quat. Based (Alcohol - Bleach Free)
Target Market(s)	Home (Kitchen) Food Process, Dairy Food Service	Hospital Jan-San Home	Healthcare
Antimicrobial Profile			
Type of Kill	Sanitizer	Disinfectant & Sanitizer	Disinfectant
Kill Profile	Bactericidal	Bactericidal Virucidal Fungicidal	Bactericidal Virucidal Tuberculocidal
Speed of Kill	1 Min. Sanitization Kills 99.9% Bacteria 30 Sec.	5 Min. Disinfection Kills 99.9% Bacteria 15 Sec.	10 Min. Disinfection

¡Thank You!